(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 305 350 A1**

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **88850273.9**

(22) Date of filing: **19.08.88**

(51) Int. Cl.4: **B 60 K 15/02**

(30) Priority: **27.08.87 SE 8703319**

(43) Date of publication of application:
01.03.89 Bulletin 89/09

(84) Designated Contracting States: **DE FR GB IT SE**

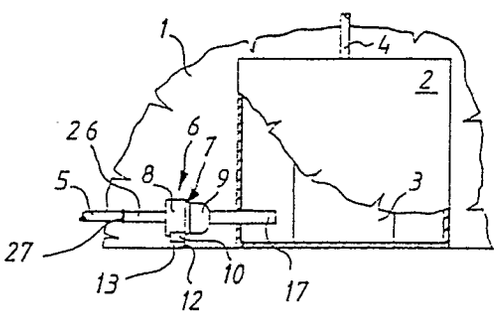
(71) Applicant: **SAAB-SCANIA Aktiebolag**
S-461 80 Trollhättan (SE)

(72) Inventor: **Olsson, Göran**
Hagstugan
S-612 00 Finspang (SE)

(74) Representative: **Holmborn, Erland Karl**
Saab-Scania AB, Scania Division Development and Production Sector Patents Fack
S-151 87 Södertälje (SE)

(54) **Arrangement for a vehicle fuel tank.**

(57) An ejector (6) is arranged in a fuel tank (1) in order to transfer fuel from the fuel tank (1) to a fuel chamber (2) arranged in the tank (1). The ejector (6) comprises a housing section (8) with an opening (10) leading to the fuel tank (1). Connected to the housing section (7) is an inlet channel (26) for the engine's surplus fuel and an evacuation channel (17) which is connected to the fuel chamber (2).



EP 0 305 350 A1

Description

Arrangement for a vehicle fuel tank

The present invention relates to an arrangement for a vehicle fuel tank, in which fuel tank an ejector is arranged which utilises the kinetic energy of the surplus fuel of a vehicle engine in order to transfer fuel from the fuel tank to a fuel chamber arranged in the fuel tank, in which fuel chamber a fuel pump is accommodated, which ejector pump comprises a housing section which is connected to an inlet channel through which the surplus fuel is supplied to the ejector and an evacuation channel which is connected to the fuel chamber and is designed with at least one opening leading to the fuel tank.

In order to ensure that air does not enter the fuel system of a vehicle, it is known to arrange a special fuel chamber inside the fuel tank. The fuel chamber is supplied with fuel by a separate ejector. The actual fuel pump is accommodated in the fuel chamber in order to pump fuel further in the fuel system. The fuel pump is designed to pump more fuel to the vehicle engine than is consumed in the combustion process in the engine. The resulting surplus fuel is returned to the fuel chamber while its kinetic energy is utilised in order to suck fuel, using the ejector, from the fuel tank to the fuel chamber.

Known ejector arrangements have a number of disadvantages. For example, in German Patent Specification DE 36 15 214, the surplus fuel is allowed to flow in a more or less uncontrolled manner past the inlet opening of an ejector at such low kinetic energy that the surplus fuel can barely give rise to a sufficiently great suction effect for the fuel chamber to be supplied with a sufficient amount of fuel. In German Patent Specification DE 24 01 728 there is a space between the nozzle of an ejector and an intake pipe. The effect of the ejector is impaired in this arrangement since the fuel splashing around in the fuel tank is allowed to penetrate into the said space and impair the suction capacity of the ejector.

The object of the present invention is to eliminate the above mentioned disadvantages. For this purpose the invention is characterised by the fact that the evacuation channel extends into the fuel chamber and empties into a free space between the fuel pump and the wall of the fuel chamber.

The arrangement according to the invention comprises relatively simple and inexpensive parts which ensure that the fuel chamber is constantly supplied with a sufficient amount of fuel from the fuel tank and which ensure that the fuel splashing around does not impair the suction capacity of the ejector.

Other features characterising the invention emerge from the subsequent patent claims and from the following description of an embodiment illustrating the invention. In the description reference is made to the attached figures of which

Figure 1 shows a schematic side view of the fuel tank in which an arrangement according to the invention is arranged,

Figure 2 shows a side view of the arrangement according to the invention, and

Figure 3 shows a plan view of the arrangement according to the invention when assembled in a fuel chamber.

Figure 1 shows schematically a fuel tank 1 in which a fuel chamber 2 is arranged. A fuel pump 3 is accommodated in the fuel chamber 2 in order to pump fuel via a fuel line form 4 to an internal combustion engine (not shown). The fuel pump 3 is designed to pump more fuel to the internal combustion engine than is consumed in the combustion process in the engine. The resulting surplus fuel is pumped back to the fuel chamber 2 via a fuel return line 5 and an ejector 6.

The ejector 6 comprises an ejector housing 7 which consists of two parts, 8, 9.

The first part 8 of the ejector housing 7 is cylindrical and designed with a channel 10 of rectangular cross section leading to the fuel tank 1. The open end 11 of the channel 10 is designed with downwardly-directed pin-shaped spacing elements 12 which bear against the bottom of the fuel tank 1 and define a gap 13 through which fuel is supplied to the ejector 6. That opening of the channel 10 which is directed towards the ejector housing 7 is provided with a filter 14, preferable of fine-meshed wire net, for preventing any free particles in the fuel from being sucked into the ejector 6.

The second part 9 of the ejector housing 7 is conical and its diametrically larger end 15 is connected to the cylindrical part 8, while its diametrically smaller end 16 is connected to a tubular evacuation channel 17.

Both the transition between the cylindrical part 8 and the conical part 9 and the transition between the conical part 9 and the evacuation channel 17 are rounded off in order to avoid flow losses in the ejector 6.

The evacuation channel 17 passes through a collar section 18, which is arranged in an outer recess 19 in the wall of the fuel chamber 2, and it extends by more than half its length into the fuel chamber essentially tangentially in relation to the fuel pump 3. The evacuation channel 17 leads into a free space between the fuel pump 3 and the cylindrical outer wall of the fuel chamber 2. The nozzle 21 of the evacuation channel 17 is in this connection designed with a conical expansion space 22 whose length L1 is at least 1/10 of the length L2 of the evacuation channels 17. In addition, the length L2 of the evacuation channel 17 is at least greater than about five times the inner diameter D1 of the evacuation channel 17 and is advantageously greater than or equal to seven and less than ten, times the said inner diameter D1.

A sealing ring 23 bears against the evacuation channel 17 and against the collar section 18. The sealing ring 23 is axially fixed between two radially outwardly directed flanges 24 on the evacuation channel 17.

The evacuation channel 17 is designed with a number of connecting elements 25 by means of

which the ejector 6 is fixed to the fuel chamber 2. The connecting elements 25 are made up of locking heads (not described in detail) which interact in a locking manner with heads on the collar section 18 which correspond to the locking heads.

The ejector also comprises an inlet channel 26, one end 27 of which is connected to the fuel return line 5 and the other end of which is provided with a throttling 28. The inlet channel 26 is advantageously a tubular element which, at its one end is designed with a converging section having a nozzle orifice 30. The outer conicity of the converging section is less than the conicity of the conical inner part 9 on the ejector housing 7 and the diameter D2 of the nozzle orifice 30 is advantageously 0.3-0.6 times the diameter D1 of the evacuation channel 17 and preferably about 0.4 times the said diameter D1.

The inlet channel 26 and evacuation channel 17 are arranged in series in the longitudinal direction of the ejector 6. The inlet channel 26 thus passes through an opening 31 in a wall 32, which delimit the ejector housing 7 towards the rear, and is introduced so far into the ejector housing 7 that its throttling 28 empties between the nozzle over the evacuation channel and the opening 10 leading to the fuel tank 1. The distance L3 between the throttling 28 and the evacuation channel 17 is about 0.8-3.5 times the diameter D2 of the nozzle orifice 30 of the throttling 28 and is advantageously about 2.0 times the said diameter D2.

The arrangement described according to the invention operates as follows.

The fuel pump 3 pumps fuel from the fuel chamber 2 via the fuel line 4 to the internal combustion engine (not shown). The surplus fuel from the internal combustion engine flows through the fuel return line 5, the inlet channel 26 and out through the nozzle orifice 30 over the throttling 28 as a controlled jet of fuel. At the same time, due to the ejector action resulting from the flow of fuel, fuel is sucked from the fuel tank 1 via the channel 10 and into the ejector housing 7. The surplus fuel and the fuel from the fuel tank 1 are then fed to the fuel chamber 2 via the evacuation channel 17.

The invention should not be regarded as being limited by the described embodiment, but can rather be modified in a number of alternative embodiments within the scope of the following basic claims.

Claims

1. Arrangement for a vehicle fuel tank (1), in which fuel tank (1) an ejector (6) is arranged which utilises the kinetic energy of the surplus fuel of the vehicle engine in order to transfer fuel from the fuel tank (1) to a fuel chamber (2) arranged in the fuel tank (1), in which fuel chamber (2) a fuel pump (3) is accommodated, which ejector (6) comprises a housing section (7) which is connected to an inlet channel (26) through which the surplus fuel is supplied to the ejector (6) and an evacuation channel (17) which is connected to the fuel chamber (2) and is designed with at least one opening leading to the fuel tank (1), characterised in that the evacuation channel (17) extends into the fuel chamber (2) and empties into a free space (20) between the fuel pump (3) and the wall of the fuel chamber (2).

2. Arrangement according to claim 1, characterised in that the evacuation channel (17) extends into the fuel chamber (2) essentially tangentially in relation to the fuel pump (3).

3. Arrangement according to claim 2, characterised in that the evacuation channel (17) extends by more than half its length into the fuel chamber (2).

4. Arrangement according to claim 1, characterised in that the evacuation channel (17) passes through a collar section (18) in the wall of the fuel chamber (2).

5. Arrangement according to claim 4, characterised in that the collar section (18) is arranged in a recess (19) in the wall of the fuel chamber (2).

6. Arrangement according to Claim 4, characterised in that the evacuation channel (17) is designed with a conical expansion space (22) the length of which is greater than or equal to 0.1 times the length of the evacuation channel (17) and in that the length of the evacuation channel (17) is greater than or equal to seven times the inner diameter of the evacuation channel (17).

7. Arrangement according to claim 1, characterised in that the opening (10) leading to the fuel tank (1) is designed as a channel which is covered by a filter (14) and is provided with spacing elements (12) bearing against the bottom of the fuel tank (1).

8. Arrangement according to Claim 1, characterised in that the inlet channel (26) is provided with a throttling (28) which empties into the housing section (7) and in that the throttling (28) is made up of a converging section designed in the inlet channel (26) and having a nozzle orifice (30).

9. Arrangement according to Claim 8, characterised in that the inlet channel (26) and evacuation channel (17) are arranged in series in the longitudinal direction of the ejector (6), the distance between the nozzle orifice (30) and the evacuation channel (17) being 0.8-3.5 times the diameter of the nozzle orifice (30) and in that the diameter of the nozzle orifice (30) is 0.3-0.6 times the inner diameter of the evacuation channel (17).

10. Arrangement according to Claim 8 characterised in that the throttling (28) empties into a conical part (9) of the housing section (7) and in that the conical part (9) has a conicity which is greater than the conicity of the converging section of the inlet channel (26).

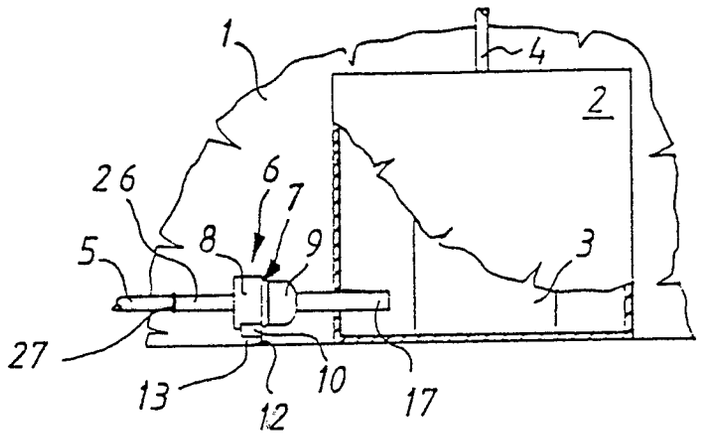


FIG. 1

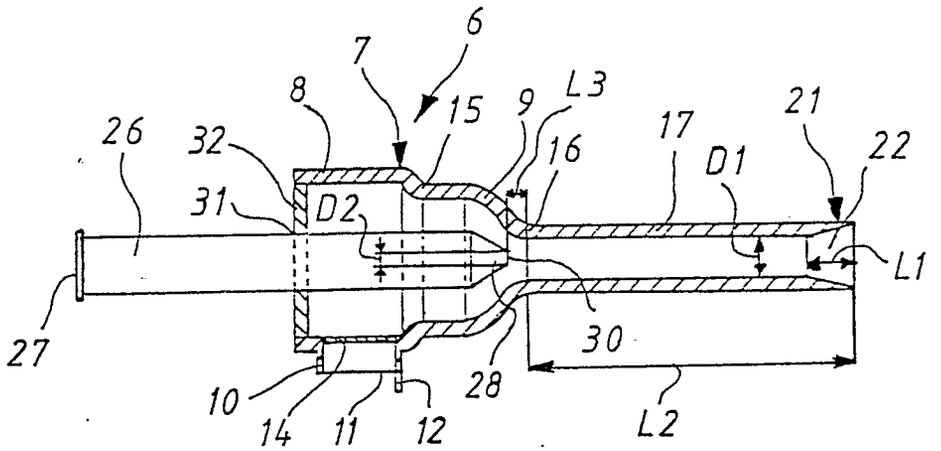


FIG. 2

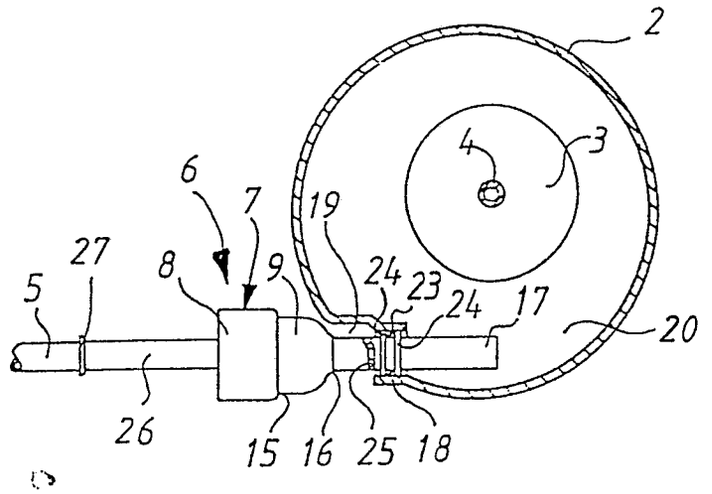


FIG. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application number
88850273.9

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl 4)
Y	DE-A- 2 453 733 (VOLKSWAGENWERK AG) *Whole document*	1,8,10	B 60 K 15/02
A		6	
	- - -		
Y	DE-A- 3 602 155 (BAYERISCHE MOTOREN WERKE AG) *Column 5, lines 11-22; figure 1*	1,8,10	
	- - -		
A	GB-A- 844 599 (DAIMLER-BENZ AG) *page 2, line 125- page 3, line 2*	2	
	- - -		

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 60 K

F 02 M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
STOCKHOLM	23-11-1988	CARLSTRÖM G.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO Form 1503 03 82